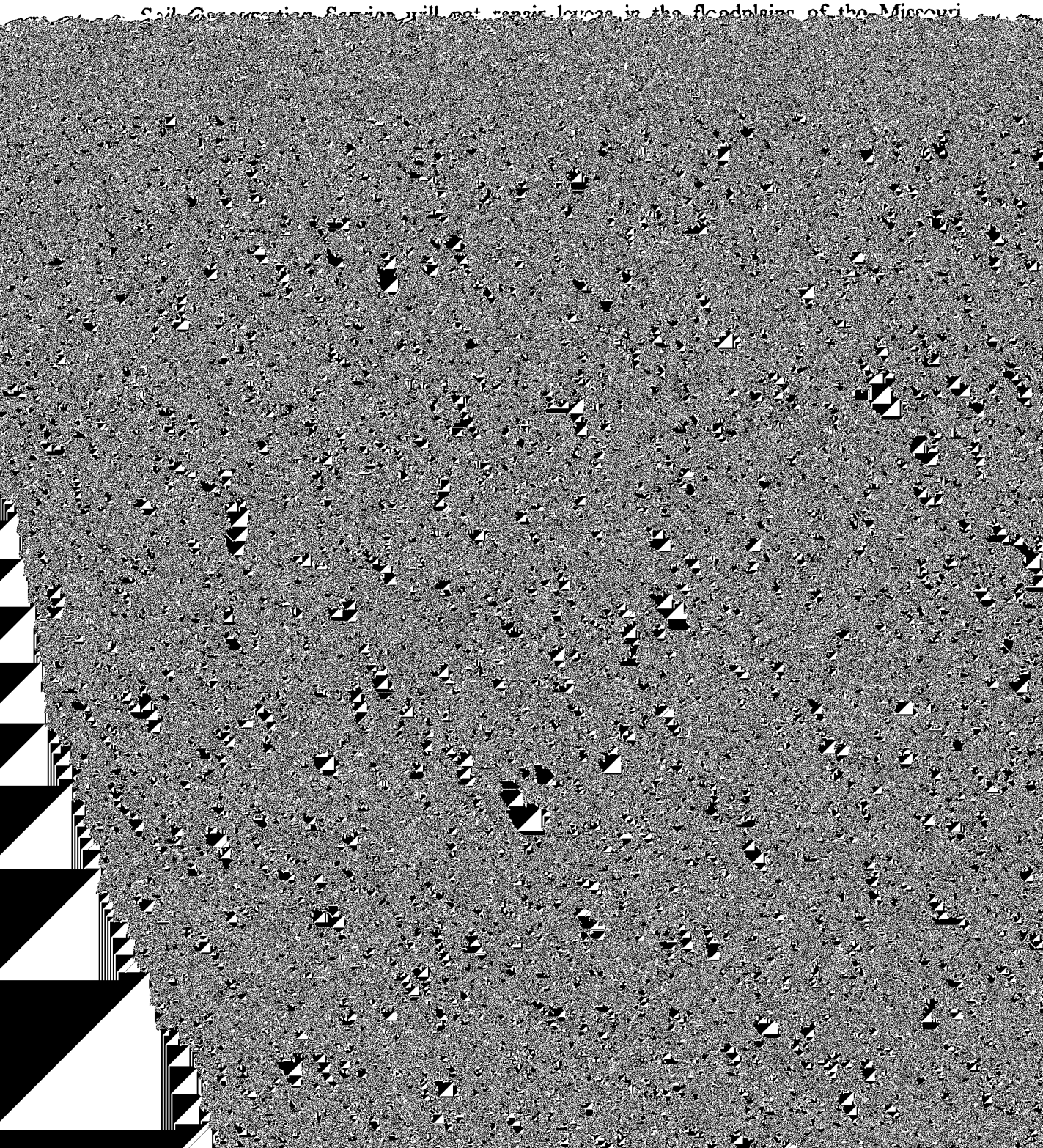
mainline levees. He and Potter suggested a general division of labor which would give the Corps responsibility for all mainline levee work along the Mississippi and Missouri rivers, as well as the lower reaches of the Grand River. SCS would bear responsibility for repairs in the rest of the state. Such a division of labor did not exactly follow the four hundred square mile rule, but had the virtue of simplicity.

In early September, SCS distributed a press release which clarified its policy: "While the Soil Conservation Service will not repair levees in the floodplains of the Missouri



estimate $5 billion in crop damage. An agricultural engineer in Iowa estimated that for every acre with two feet of sand, six acres were required to work it into the soil in order to partially restore the land's productivity. This work was delayed time and again due to rains.[290]

Even before the water had receded enough for EWP work to begin in earnest, the Service's response to sand deposits combined a variety of disciplines. For example, in August the staff of the state office combined a variety of technologies in order to provide statistical data on flood damage. By analyzing colors and textures on an aerial video of the Missouri River floodplain shot by the FWS, the Resources Information Management Section under Bob Ball determined the rough percentage of cropland covered by sand and estimated the depth of that sand. Terry Barney of this section and Ken Vogt of the soils staff performed much of this analysis. (The attached map details this phenomena near Hartsburg, a small town near Missouri's state capital of Jefferson City.) They then extrapolated this data and were able to make estimates as to the total areas covered by sand as well as its depth throughout the floodplain, which is the heartland of Missouri's agriculture. By combining this data with information from the soils staff, they determined the depth of plowing needed at each depth of sand to at least partially restore soil productivity. The data was then correlated with price estimates from local contractors for deep plowing or sand removal work in order to give people an idea of the great expense and effort that lay ahead.[291] Finally, the public affairs staff made this data widely available to the public.[292]

The 1993 flood presented SCS soils experts with other vexing problems. Besides the problem of the amount of sand was its varying texture and strata. Bruce Thompson, state soil scientist, pointed out that the two peaks of the flood left two distinct layers in many places. The first flooding in June and July was relatively minor. The water generally moved slower and thus was able to move only smaller particles of sand onto farmland. These particles could be plowed into the soil with relative ease. The second high water in August and September was more devastating. It blew out many levees. The faster moving, more forceful water carried heavier sand particles which were placed on top of the first layer, thus creating a "sandwich" of coarse sand or gravel, fine sand, and finally soil. This phenomena was especially prevalent near major ruptures in levee systems. Staff at the state and local level stressed that farmers were eager to get information on restoring soil fertility as quickly as possible in order to reserve the special heavy plowing equipment that many would require.

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290 "Farmers Eye Post-Flood Season," AP newswire, September 13, 1993.

291 The price data came from an agricultural extension engineer at the University of Missouri.

292 Missouri's sand and levees problems were the focus of a front-page article in the *New York Times* on June 9, 1994. The newspaper also used SCS's maps.

of meetings in nine locations across Missouri in order to answer questions from the public, press, and politicians.[295] SCS also exchanged information with state agencies, especially the Department of Natural Resources and the Department of Agriculture. In October, SCS and the University Extension from the University of Missouri and Lincoln University cooperated to produce a fact sheet which helped farmers assess the costs and difficulties of reclaiming their farmland. It included detailed information developed by SCS on incorporating sand into the soil in order to restore fertility.

State staff kept those in Washington informed of obstacles and progress in repair work, a task that involves both reporting statistical data and trying to draw attention to the unique needs of each their state. In late October of 1993, Russ Mills, state conservationist for Missouri, along with deputy director of the Missouri Department of Agriculture, Kyle Vickers, a wetlands specialist from the Missouri Department of Conservation, Steve Young, and a farmer from Ray County, Bob Vandiver, held a National Headquarters Seminar for USDA employees. Vandiver's farm, in the Missouri Valley Drainage and Levee District, was damaged due to a thirty-nine hundred-foot levee breach. These men focused on the vast problems associated with sand deposits in the Missouri River floodplain. The high velocity of the water in this flood picked up and spread relatively heavy materials far from the river, especially in areas downstream from bridges, which tended to constrict and speed the flow of water. The water then spread out across the floodplain, slowed, and deposited sand or gravel. Mills estimated that it could cost up to $4,000 to remove one foot of sand from one acre of farmland. He and Vandiver stressed the need to provide clear policies on wetlands and levee repairs quickly so that farmers could make their decisions on next year's planting.

Missouri landowners were eager to participate in the EWRP program.[296] This state had the highest number of sign-ups and acres enrolled. As was the case in Iowa, SCS worked closely with the state government. The Department of Conservation offered to provide an additional $200 to $300 per acre in order to purchase title to the land after SCS had obtained the easement. Thus, landowners could free themselves from any tax

and local level emphasized that farmers wanted concrete information on alternatives to structural repairs or cropland restoration. For example, those involved with the pilot WRP program in Missouri stressed that farmers had shown a great deal of interest in the 1992 program and were even more eager to participate in the wake of the flood. The problem was not simply in gathering technical or field data, although high water delayed this task, but also in obtaining overall guidance on policies.

Wisconsin and Minnesota

Although their agricultural output was devastated by the disaster of 1993, Wisconsin and Minnesota were the states with the smallest EWP efforts. These two states highlight the limits of the emergency program.

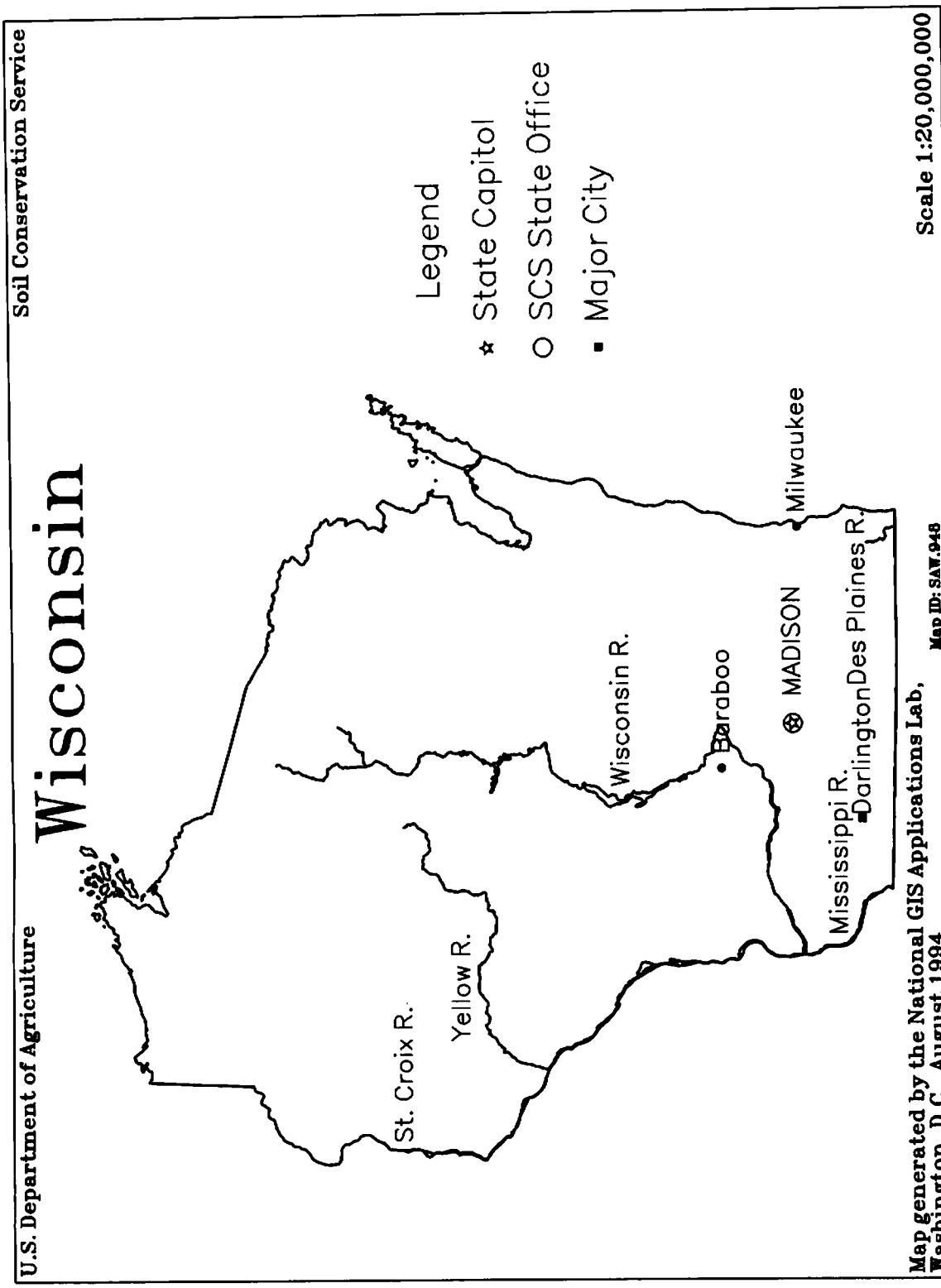
The experience of Wisconsin illustrates the long-term nature of this flood event. For farmers, this disaster began with the cool and wet weather in September of 1992. The ground was saturated even before the torrential rains of the spring and summer of 1993. Most damage was in the southwest part of the state. The Badger State suffered approximately $800 million in agriculture-related damages due to the flood.[297] According to the Service in Wisconsin, over eight hundred thousand acres of agricultural land (seven percent of the state total) suffered erosion of over ten tons per acre due to the extended rains on saturated soils which led to the flooding of the main rivers. It was expected to cost $10.8 million to implement the land treatment practices necessary to protect the remaining topsoil and restore productivity to the land. Further, the floods delayed the construction of conservation measures required to meet the conservation compliance provisions of the Food Security Act. Nevertheless, Wisconsin SCS-ers reported that conservation practices already in place, such as contour strip cropping and conservation tillage, reduced the amount of soil washed away by up to five hundred percent.[298]

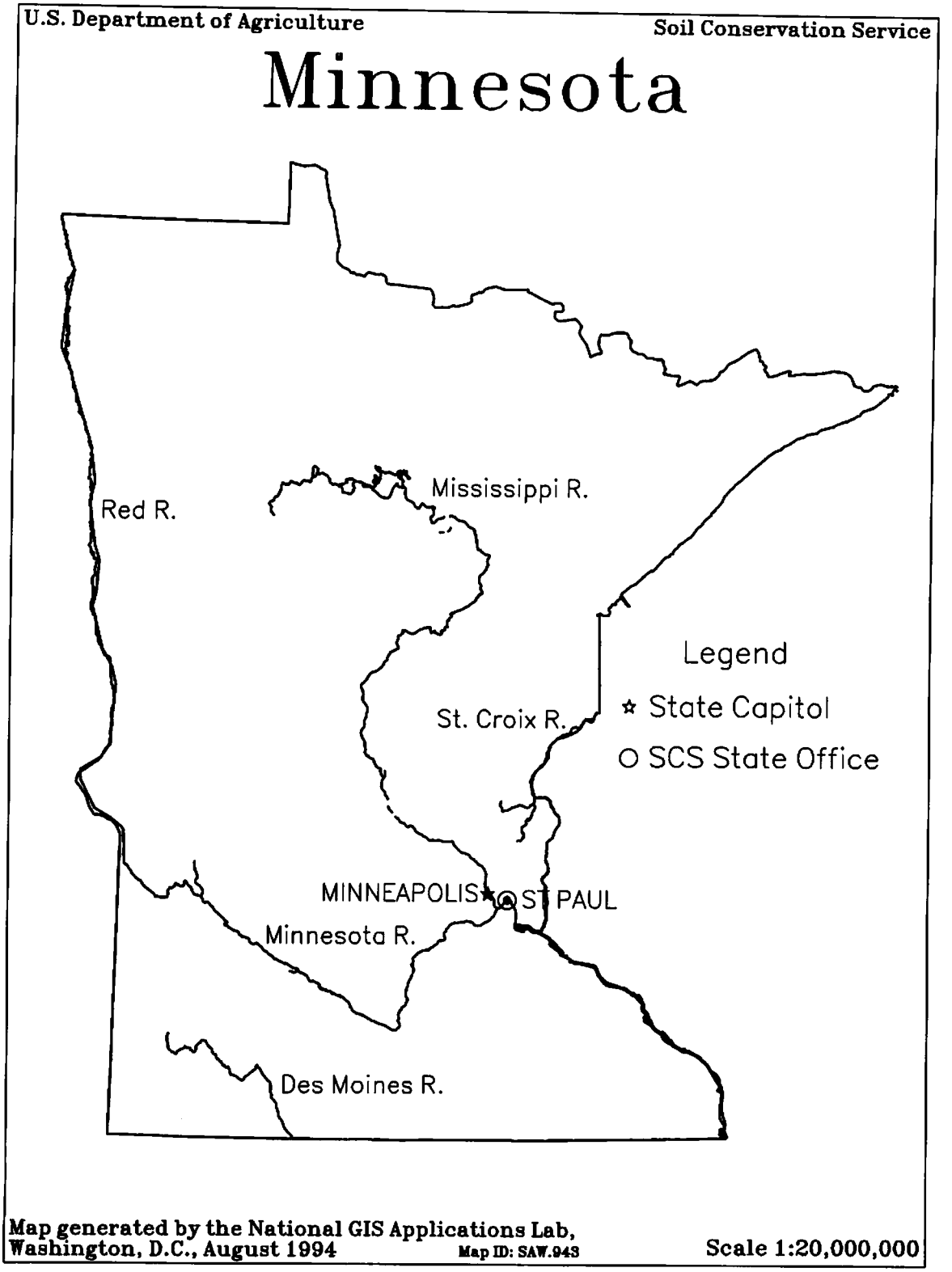
On July 18, a particularly severe hydrologic event occurred in the Baraboo area.[299] By late August, a special field office had been established in Baraboo to service EWP sites. SCS worked with FEMA, local officials, and the Wisconsin Department of Natural Resources to facilitate repair work. At that time, fourteen damage sites were feasible for EWP (that is, they were feasible from an engineering and economic point of view).[300] By mid-1994, it became clear that Wisconsin would have one of the smallest EWP efforts--the state office handled only twenty-three requests for assistance. Of the eighteen requests which were eligible for the emergency program, eight were for debris

[297] For a detailed account of this state's experience with the floods, see Gary Heinrichs, ed., *The Floods of 1993: The Wisconsin Experience* (Bureau of Water Regulation and Zoning, Wisconsin Department of Natural Resources, 1994).

[298] Karl F. Otte, Acting Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA Emergency Coordinator, Office of the Assistant Secretary for Administration, Report #8, July 12, 1993.

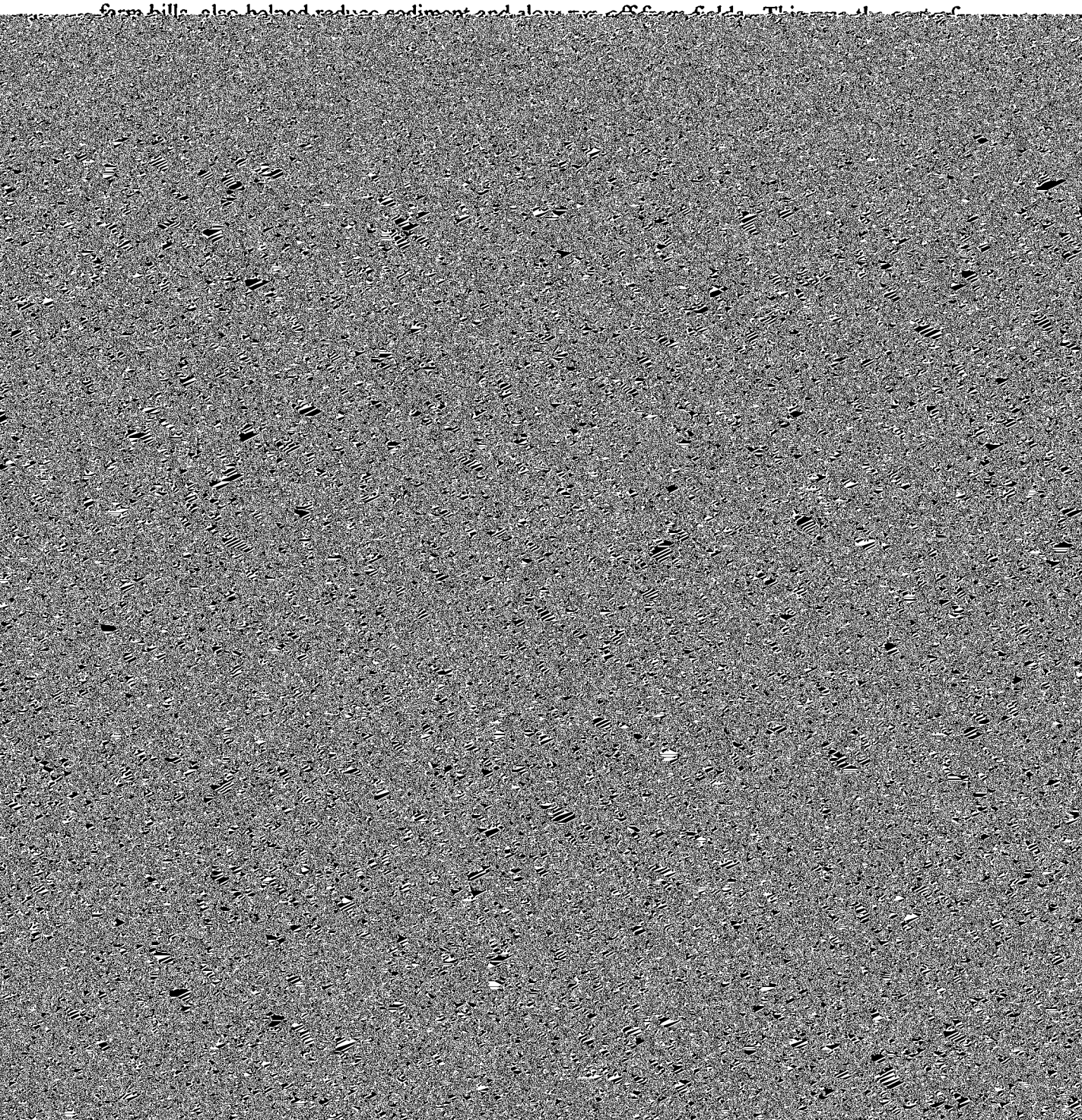

WHITE


U.S. Department of Agriculture
Soil Conservation Service
Wisconsin
Legend
State Capitol
SCS State Office
Major City
St. Croix R.
Yellow R.
Wisconsin R.
Baraboo
MADISON
Milwaukee
Mississippi R.
Darlington
Des Plaines R.
Scale 1:20,000,000
Map generated by the National GIS Applications Lab, Washington, D.C., August 1994
Map ID: SAW.948


U.S. Department of Agriculture
Soil Conservation Service
Minnesota
Red R.
Mississippi R.
St. Croix R.
Legend
State Capitol
SCS State Office
MINNEAPOLIS
ST PAUL
Minnesota R.
Des Moines R.
Map generated by the National GIS Applications Lab, Washington, D.C., August 1994
Map ID: SAW.943
Scale 1:20,000,000

The heavy rains of May marked the start of the great flood of 1993 in Minnesota.[302] For the next four months, the state would be hit by major storms. In Minnesota, some farmers had their crops washed out by heavy rains three times by early July.[303] The most severe damage was in the southwestern part of the state. Due to storms in late July, however, the damage area expanded into the south-central part of the state.[304] A total of

Investigations by experts in the Scientific Assessment and Strategy Team, data collected by SCS, and anecdotal evidence all suggest that the programs managed by the Service have made important contributions to the management of America's water resources, including flood control and prevention. This was most clear in projects built under the auspices of the Small Watershed Program. The combination of structural measures, such as small dams, and non-structural, like land treatment practices, reduced the local severity of flooding. In light of proposals to cut the Small Watershed Program in the FY 1995 budget, however, the future of these efforts appeared in doubt.[307] Other activities, such as enforcement of the conservation compliance provisions of the 1985 and 1990 farm bills, also helped reduce sediment and slow runoff from fields. This was the goal of



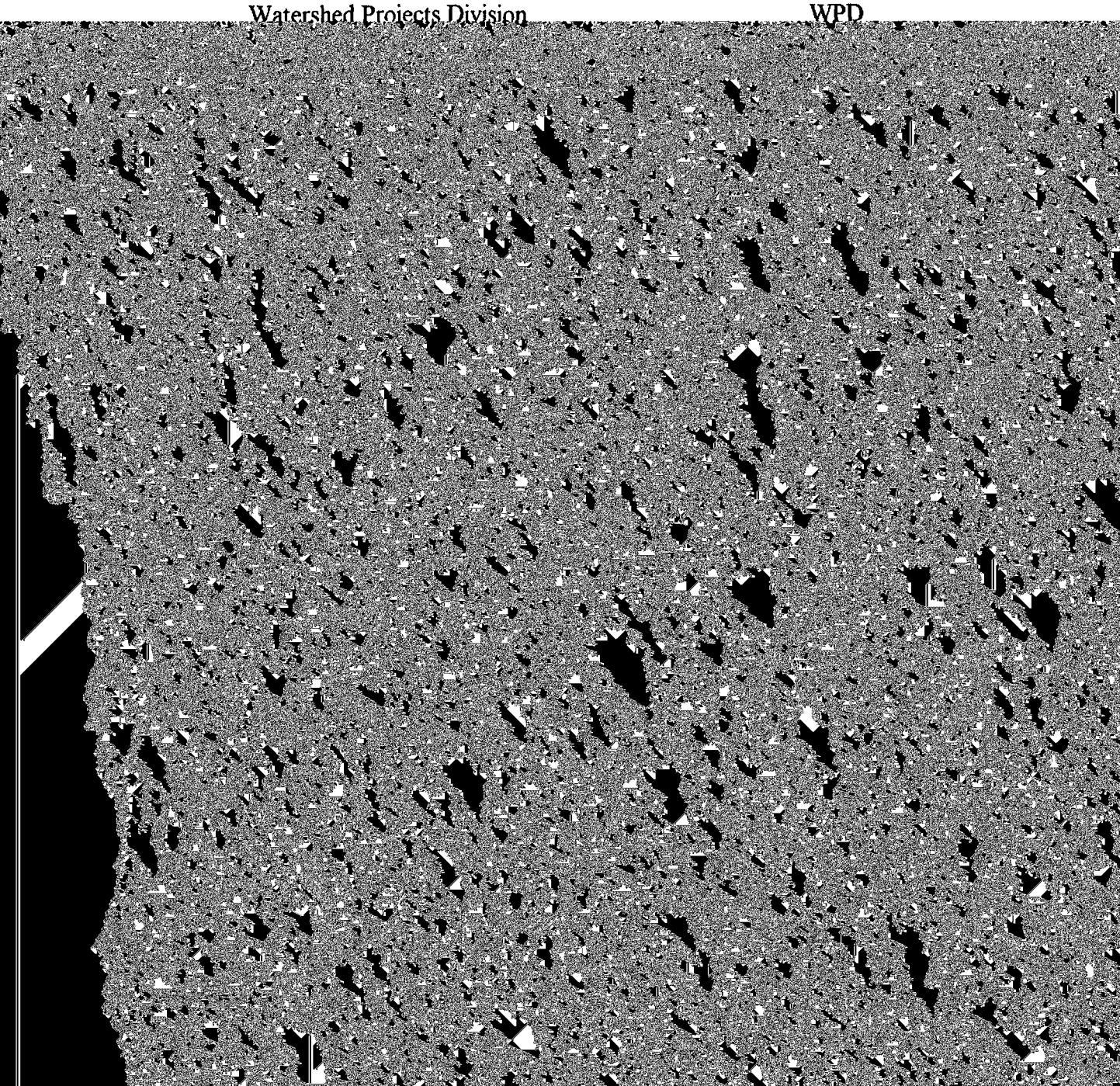
Matching the interests of Washington with local goals proved difficult. The problem boiled down to this: what appeared to be an insignificant change from the national level translated into a major trauma for a single town, watershed, levee district, or individual farmer. A local community would fight hard to protect what it perceived to be in its interests--often by demanding an exception to a national policy, such as those developed for levee repair. Employees of the Service at times shared this disconnect with the national-level policy makers. For example, a district conservationist in a small town had

Appendix A

Frequently Used Acronyms

Agricultural Stabilization and Conservation Service	ASCS
Area Conservationist	AC
Bureau of Indian Affairs	BIA
Cable News Network	CNN
Computer Aided Design	CAD
Conservation Reserve Program	CRP
Cooperative Extension Service	CES
Damage Survey Report	DSR
Department of Housing and Urban Development	HUD
Disaster Field Office	DFO
District Conservationist	DC
Economic Development Administration	EDA
Economics and Social Sciences Division (SCS)	ECN
Emergency Conservation Program	ECP
Emergency Watershed Protection	EWP
Emergency Wetlands Reserve Program	EWRP
Engineering Division (SCS)	ENG
Environmental Defense Fund	EDF
Environmental Protection Agency	EPA
Extension Service	ES
Farmer's Home Administration	FmHA
Federal Emergency Management Administration	FEMA
Fish and Wildlife Service	FWS
Food Safety and Inspection Service	FSIS
Food Security Act	FSA
Memorandum of Understanding	MOU
Midwest National Technical Center	MNTC
National Agricultural Library	NAL
National Headquarters (SCS)	NHQ
National Oceanic and Atmospheric Administration	NOAA
National Park Service	NPS
National Weather Service	NWS
Office of the Inspector General	OIG
Office of Management and Budget	OMB
Resource Conservation and Development	RC&D

Rural Development Administration	RDA
Resources Inventory and Geographic Information System Division	RIGIS
Scientific Assessment and Strategy Team	SAST
Small Business Administration	SBA
Soil Conservation Service	SCS
Tree Assistance Program	TAP
U. S. Army Corps of Engineers	COE
U. S. Department of Agriculture	USDA
U. S. Geological Survey	USGS
U. S. Government Printing Office	GPO
Watershed Projects Division	WPD



Appendix B

Assistance from SCS Personnel

The following is a list of SCS personnel who were interviewed or provided other important information to assist in the preparation of this history.

Martin W. Adkins	EWP Coordinator	Iowa
David Anderson	Assistant State Conservationist	Mississippi
Lyle Asell	Assistant State Conservationist	Iowa
James E. Ayen	State Resource Conservationist	Iowa
Larry Babich	Liaison for the West and Midwest	WPD
Robert E. Ball	State Resources Information Manager	Missouri
Gene P. Barickman	Biologist	Illinois
Terry Barney	Natural Resources Data Base Manager	Missouri
Robert Bartles	Midwest Flood Recovery Coordinator	MTNC
Lynn A. Betts	Information Officer	Iowa
Dennis F. Beyer	Design Engineer	Illinois
George Bluhm	Midwest Flood Coordinator	WPD
Ross B. Braun	Water Resources Planning Specialist	Missouri
Arthur A. Bryant	Supervisory Contract Specialist	Iowa
Don Butz	Program Manager	Land Treat.
Timothy Christian	Public Affairs Specialist	Kansas
Charles E. Cobb	Deputy State Conservationist	Wisconsin
J. Reese Coulter	Area Engineer	Missouri
Earl E. Evans	Civil Engineer	Illinois
James L. Evans	Assistant State Conservation Engineer	Illinois
Paul G. Goldsmith	District Conservationist	Iowa
Pat Graham	Biologist	Missouri
Allen Green	Assistant State Conservationist	Missouri
Laura E. Greiner	Water Quality Information Specialist	Iowa
Douglas Helms	National Historian	ECN
Leroy Holtsclaw	Assistant State Conservationist	South Dakota
George T. Huey	State Administrative Officer	Illinois
Keith Hunt	Contract Specialist	Iowa
Mervin Ice	National Construction Engineer	ENG
Mark J. Jensen	State Conservation Engineer	Iowa
Kay Kitchen-Maran	Public Affairs Specialist	Illinois
Norm A. Klopfenstein	State Information Officer	Missouri
Jack D. Langford	Civil Engineer	Iowa
Glenn Lawson	GIS Specialist	RIGIS

Brian Lehman	Civil Engineering Technician	Iowa
William Lewis, Jr.	Agricultural Economist	Illinois
Ione Lyne	Secretary	WPD
Richard P. Macho	Area Conservationist	Illinois
Pat McGrane	Public Affairs Specialist	Nebraska
Mary Ann McQuinn	Public Affairs Specialists	Pub. Aff.
Harry N. Means	State Conservation Engineer	Illinois
Paige E. Mitchell	Public Affairs Specialist	Illinois
Thomas J. O'Conner	Rural Development Forester	Iowa
Karl Otte	Assistant Director	WPD
Gary N. Parker	Assistant State Conservationist	Illinois
John Peterson	Assistant Chief for the Midwest	NHQ
Cordes L. Potter	Civil Engineer	Missouri
Lane Price	National GIS Applications Leader	RIGIS
Charles E. Rahm	Public Affairs Specialist	Missouri
James Reel	WRPS Leader	Iowa
Edward G. Riekert	Director	WPD
Richard A. Rogers	Archaeologist	Iowa
David F. Rohlf	Assistant State Con. Engineer	Iowa
Roger G. Schnoor	Civil Engineer	Iowa
Harry S. Slawter	Assistant State Conservationist	Illinois
Janice A. Stanton	Administrative Services Officer	Illinois
Linda Stoltz	Contract Specialist	Ohio
Bruce Thompson	State Soil Scientist	Missouri
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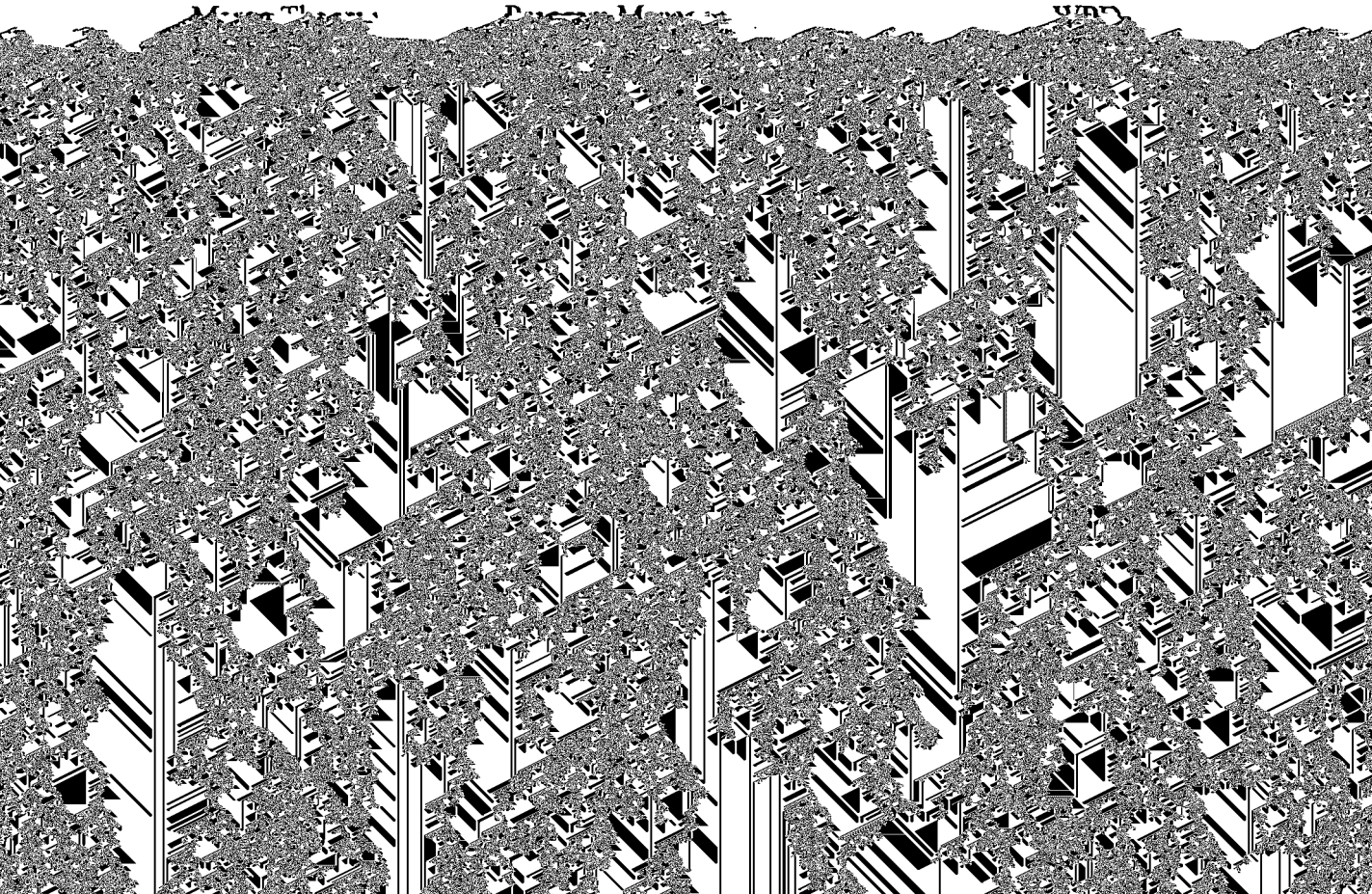

Appendix C

Photography Credits

page	
cover	Scouring in Missouri. Photo by Norm Klopfenstein, SCS-Missouri.
2	Flooding in Iowa. Photo by Ken Hammond, USDA, 93 CS 358.
14	Center-pivot irrigation system in Iowa. Photo by Ken Hammond, USDA, 93 BW 1669-33.
29	Secretary Espy tours flood area. Photo by Meg Evans, USDA, 93 CN 0474-17.
35	Terraces in Iowa. Photo by Tim McCabe. SCS. IA-2856.

Appendix D

List of Charts and Maps

Charts/Diagrams

Maps

The charts and graphs were prepared by J. D. Ross of SCS's Economics and Social Sciences Division.

Versacad diagrams were prepared by Brian Lehman, Civil Engineering Technician in Iowa.

Maps used in the volume were prepared by the Soil Conservation Service's Resources Inventory and Geographic Information System Division. The author gratefully acknowledges the assistance of Lane Price and Stacey Wood.